THE GEOGRAPHIC CONCENTRATION OF NEW FIRM FORMATION AND HUMAN CAPITAL: EVIDENCE FROM THE CITIES

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Abstract

The role of education and human capital externalities is a key variable in theories of economic growth. However, the mechanism by which these externalities are realized has not been fully investigated. We examine the relationship between area differences in the levels of human capital and subsequent differences in new firm start-up rates. Firm start-ups are usually based on an innovation (in product, process, or market) that derives from utilization of new knowledge. We find that the new firm start-up rates in areas that function as integrated labor and consumer markets (city plus surrounding commuter area) are (1) positively related to the share of adults with college degrees, and also (2) positively related to higher levels of existing establishments in the same industry and area sector. The finding that higher concentrations of existing establishments in the same industry segment were strongly associated with higher startup rates suggests that spillover of relevant knowledge from other local business owners/managers and researchers within each industry contributes to greater innovation and growth in the area.
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1. INTRODUCTION

The role of education and human capital externalities is a key variable in recent theories of economic growth. Models posited by Romer (1986), Lucas (1993) and Krugman (1991) link such externalities within a geographically bounded region to higher rates of growth. Lucas (1988) emphasizes that the economies of metropolitan areas are a natural context in which to understand the mechanics of economic growth, and an important factor contributing to this growth is the catalytic role of human capital externalities within the cities. While the benefits of human capital to individuals have been extensively studied, economists are now realizing that individuals do not capture all of the benefits from their own human capital. Some benefits spill over to their colleagues and observers -- through discussions, example, publications, and even more positive attitudes toward change, risk, and new knowledge.

Several interesting findings provide some groundwork for our study. First, Rauch (1993) finds that cities with higher average levels of human capital also have higher wages and land rents. Second, Glaeser et al (1995) find that for a cross section of cities a key economic determinant of growth is initial level of schooling, just as has previously been found for countries. They suggest that higher education levels influence later growth, not through increased savings, but by promoting higher rates of growth of technology through spillovers. Finally, Simon and Nardinelli (2002, 1996) find historical evidence for both the United States and the United Kingdom that cities with more knowledgeable people grow faster in the long run because (a) knowledge spillovers are geographically limited

to the city and (b) knowledge is more productive in the city within which it is acquired.

None of these studies, however, ask the question, “What type of activity do more-educated people pursue that leads to faster economic growth?” This question is important because if we wish to explain how growth occurs we need to identify the transmission mechanism from human capital to growth. Jovanovic and Rob (1989) develop a model where individual agents augment their knowledge through pair-wise meetings at which they exchange ideas. In each time-period, each individual seeking to augment his knowledge meets an agent chosen randomly from a distribution of agents. The higher the average level of human capital of the agents the more “luck” the agents will have with their meetings and the more rapid will be the diffusion and growth of knowledge. If this knowledge contributes to technical innovations, new products, processes, or markets, we have a microeconomic foundation not only for the impact of human capital externalities on total factor productivity, but also for making those external effects dependent on both the average level of human capital and the local intensity of individuals with relevant knowledge or examples to share.

In a world of perfect information, employed agents confronted with new economic knowledge would not face a choice between developing the innovation within their existing firm or taking it outside. However, the asymmetry of such knowledge leads to a host of agency problems spanning incentive structures, monitoring and transaction costs. The existence of such agency costs provides an incentive for agents with new ideas to form their own new firms. And further,

this same asymmetric nature of information causes the rate of new firm start-ups to vary from city to city, depending on the underlying knowledge conditions in each (Audretsch, 1995),

In this paper, we empirically investigate how the new firm formation rates (and the subsequent survival of these new firms) are influenced by human capital differences in 394 labor market areas, while controlling for other regional characteristics that are also likely to affect firm formation rates. This analysis contributes to a regional growth literature, with its focus on human capital closely following much earlier work of Jacobs (1969) and Marshall (1890). This paper also contributes to the recent cross-sectional literature that argues that new ideas are important for economic growth (Glaezer et al 1992 and 1995). The focus on new firm formation also contributes to the growing literature on entrepreneurship (Lazear, 2002, Krueger and Pischke, 1997).

Section 2 presents the data and discusses measurement of the new firm formation rate. Section 3 examines how and why the new firm formation rates in the service sector vary across geographic regions. Section 4 presents the empirical model, and the basic results for the service sector as a whole are in section 5. Section 6 examines results for nine subsectors of the service sector. Section 7 reexamines new service firm formations in terms of their three-year survival and exit data, and our conclusions are briefly discussed in the final section. We find that the extent of human capital already in a region has a significant effect on the new service firm formation rate. The service firm formation rate is even more sensitive to how densely populated (with

establishments per thousand people) the local service sector already is. The greater this density is, the more probable are the relevant knowledge spillovers, and the more likely that the resulting new ideas will lead to new firm formations.

2. MEASUREMENT OF NEW FIRM FORMATION RATE

The Data

Most studies of firm birth rates have relied on net changes in numbers of establishments in consecutive years of Census' County Business Patterns aggregate data, although these provide only the net changes in numbers of business locations, without distinguishing between firms and establishments. Some use private data sources such as Dun and Bradstreet data, for which both the scope of coverage and the timing of new reports are issues. This study uses a new database that the Bureau of the Census has constructed for study of entry, survival, and growth in different types of businesses. The Longitudinal Establishment and Enterprise Microdata (LEEM) file has multiple years of annual data for every U.S. private sector (non-farm) business with employees. The current LEEM file facilitates tracking employment, payroll, and firm affiliation and (employment) size for the more than eleven million establishments that existed at some time during 1989 through 1998. This database was constructed by the Bureau of the Census from its Statistics of U.S. Business (SUSB) files,[1] which were developed from the microdata underlying the aggregate data published in Census' County Business Patterns. These annual data describing establishments were linked together using the SUSB Longitudinal Pointer File,

which facilitates tracking establishments over time, even when they change ownership and identification numbers.

The basic unit of the LEEM data is a business establishment (location or plant). An establishment is a single physical location where business is conducted or where services or industrial operations are performed. The microdata describe each establishment for each year of its existence in terms of its employment, annual payroll, location (state, county, and metropolitan area), primary industry, and start year. Additional data for each establishment and year identify the firm (or enterprise) to which the establishment belongs, and the total employment of that firm.

A firm (enterprise or company) is the largest aggregation (across all industries) of business legal entities under common ownership or control. Establishments are owned by legal entities, which are typically corporations, partnerships, or sole proprietorships. Most firms are composed of only a single legal entity that operates a single establishment—their establishment data and firm data are identical, and they are referred to as "single unit" establishments or firms. The single unit businesses are frequently owner-operated. Only 4 percent of firms have more than one establishment, and they and their establishments are both described as multi-location or multi-unit. [2]

New firm formations include both new single-unit firms with less than 500 employees, and the primary locations of new multi-unit firms with less than 500 employees, firm wide. Those new firms that had 500 or more employees in their first year of activity appear to be primarily offshoots of existing companies.[3]

Single unit firm formations in year t are identified on the LEEM as non-affiliated establishments with a start-year of t or t-1 that had no employment in March of year t-1, and had positive employment below 500 in March of year t. This avoids inclusion of either new firms that have not yet actually hired an employee, or firms recovering from temporary inactivity.[4] The 'start-year' is the year that the establishment entered the Census business register. We have also included most of the relatively few multi-unit firms (1500 to 6000 per year) that appeared to start up with less than 500 employees in multiple locations in their first year. We limited multi-unit firm formations to those whose employment in their new primary location constituted at least a third of their total employment in the first year.[5] This rule effectively eliminated the 600 to 1000 new firms each year which were apparently set up to manage existing locations -- relatively small new headquarters supervising large numbers of employees in mainly older branch locations which were newly acquired, or perhaps contributed by joint venture partners.

The Unit of Observation

Within the United States, there are many levels of geographic units that have some economic data associated with them. Politically defined units include states, counties, cities and towns. But such politically defined units have boundaries that rarely represent the borders of functional economic areas. The U.S. Bureau of the Census has defined census tracts (areas of 3,000 to 5,000 residents) to facilitate collection of detailed data on where people live, and Metropolitan Statistical Areas (MSAs) for aggregation of politically defined urban

units into more functional metropolitan areas. Most of the data collected for these measurement units are based on where people live, rather than where they work or shop.

Data for geographic units based on the location of business establishments (where people work) are needed for measuring the effect of location-specific economic growth, productivity, employment, and other economic factors. These are also collected for various political units – particularly for states and counties. Although local government units (cities and towns) generally collect some economic data, they are rarely comparable across areas, because these data are frequently dependent on local tax laws. The city has the advantage of being a smaller geographic unit, within which there is reasonably integrated economic and social activity, which might be important for spillovers operating in dense areas. However, city boundaries are often quite arbitrary relative to the local patterns of economic activity, and their relatively small size means that they may be substantially influenced by neighboring political units.[6]

State and county level business data collected by the federal government are generally comparable across all the states, but most states are composed of multiple, diverse economic areas. Therefore analyses of economic data based on states as geographic units usually suffer both from aggregation problems due to the diversity of economies with a state. On the other hand, many integrated local economic areas cross both state and county boundaries, and both people and businesses flow freely back and forth across these boundaries, so the economic behavior of agents within a given state or county may be significantly

affected by unmeasured influences from adjacent areas in other states or counties.

Metropolitan Statistical Areas (MSAs) are multi-county units that are defined to include all of the densely populated areas surrounding the larger cities. These geographic units do a better job of ensuring that people both live and work within their boundaries. However, they are based on residential population densities, without regard for where people work. In addition, they are periodically redefined to keep pace with changing urban population patterns, and they exclude large areas of the country whose local economies are not centered on large cities.

The geographic unit of analysis chosen for this study, Labor Market Areas (LMAs), substantially avoids all of the problems associated with the units discussed above. LMAs are aggregations of the 3,141 US counties into 394 geographical regions based on the predominant commuting patterns (journey-to-work). Each LMA contains at least one central city, along with the surrounding counties that constitute both its labor supply and its local consumer and business market.[7] Many of the 394 LMA's cut across state boundaries, to better represent local economic areas. The LMA unit of observation has the advantage of including both the employment location and the residence location of the population and labor force within the same area. Being based on counties, a wide variety of data collected at the county or Zip-code level can be aggregated to construct LMA-level data. Finally, the 394 LMAs together cover the whole

country, so that their data can be aggregated to U.S. totals, and all areas are represented. [8]

The Sector of Inquiry

This paper focuses on the service sector of the U.S. economy. Why do we feel that the service sector is preferable to manufacturing for analysis of new firm formation? First, there has been widespread concern among economists and policy makers alike about the dynamics of the service sector. The slowness of productivity growth in services, together with its rising share in nominal GNP and in employment, has been accused of exerting a major drag on productivity growth of the overall economy and its competitive performance. Second, the service sector has been growing much faster than other sectors, increasing its share of private employment from 28.3% in 1990 to 32.8% in 1998. Third, the broad range of firms in the service sector employ workers with a wide variety of skills, and tend to be more labor-intensive than capital-intensive, so that area differences in human capital may have a stronger impact on the service sector than on more capital-intensive sectors. Fourth, new firm formation rates are much higher in the service sector than in the manufacturing sector (Acs and Armington, 2002). Indeed, cities with high concentrations of manufacturing have typically been the slowest growing cities over the past twenty years. Finally, much of the growth in service jobs has been in new firms. While some of these new firms merely replace older establishments that have closed, many others serve new markets, provide new services, or apply innovative techniques to compete with older businesses.

The local economic impact of formation of a new service firm is much broader than the immediate impact we can measure from the number of new jobs they create in the first year. New service firms may be providing the local market with services that were not previously available, or competing with existing providers to drive down prices or improve services. If their services are exportable, the new businesses may be generating income from outside the region, and perhaps contributing to a local specialized cluster that will attract yet more businesses and employees. And of course the new firms will buy products and other services from local businesses.

The Firm Birth Rate

Firm birth rates are calculated for each of the 394 LMAs, based on new firm formations during each of three recent time periods -- 1990 through 1992, 1993 through 1995, and 1996 through 1998.[9] Because the Labor Market Areas vary greatly in size, the absolute numbers of new firm formations must be standardized by some measure of the LMA size before it is meaningful to compare them across areas. When dealing with the whole service sector, firm formation rates are calculated as the number of new firms per thousand labor force in the LMA in the prior year. This labor force approach has a particular theoretical appeal, in that it is based on the theory of entrepreneurial choice proposed by Evans and Jovanovic, (1989). Each new business is started by a worker, and the labor market approach implicitly assumes that the entrepreneur starts the new business in the labor market where he or she previously worked.

When comparing new firm formation rates for different subsectors of the

service industry we need to standardize for both the differences in size of both areas and subsectors. For this purpose we express new firm formation rates in terms of the number of new firms relative to the number of establishments already in existence in that subsector and LMA. This could be termed the ecological approach, because it considers the amount of start-up activity relative to the size of the existing population of businesses.

Two considerations of timing of the firm birth rate data should be noted. While new firms enter the business register underlying the LEEM file on a nearly continuous basis, their employment data are reported only for a pay period in March of each year. Since we require positive employment before recognizing new firm, if a firm begins activity after March, we do not count its formation until the following year. Therefore, each specified year's firm formation counts actually represent firms that hired their first employees sometime between April of the prior year and March of the specified year, for an average of nine months lagged reporting (Acs and Armington, 1998). Further, Reynolds et al (1995) and others have shown that the time between an individual's decision to create a new firm and the start of the resulting economic activity averages about two years, and is often longer. With such lags in the initialization and reporting of new firm formations, we do not expect to be able to identify a lag structure between differences in their annual rates and the regional factors associated with these differences, even though we have nine years of annual data on new firm formations.

Variations in Regional New Firm Formation Rates

Table 1 shows annual variations in the numbers of new firm formations and the birth rate for service firms in the U.S. Gross service firm formations were increasing fairly steadily during the 1990s, to just under 200,000 in 1998, or nearly two fifths of all firm formations. Net service firm births, defined as annual firm formations minus firm deaths during the same year, average about 25,000 during the 1990s, and vary widely. Net firm births in services accounted for about two thirds of the net firm births in all industries in most of these years (not shown). The rate of new service firm formation per thousand workers in the labor force increased from 1.375 in 1990 to 1.452 in 1997, and it fell slightly in 1992 and again in 1998. Services accounted for 35.1% of all firm formations in 1990, and increased their share to 38.4% of all firm formations in 1998. At the same time, employment in services increased from 28.3% of total to 32.8.

Table 2 looks at some of the regional variation across LMAs in the new firm formation rates, again using the number of new service firm formations per thousand workers in the labor force. Table 2a shows the twenty LMAs that have the highest average birth rates in the period of 1996 through 1998, as well as the twenty lowest. The top twenty LMAs ranked by birth rate had an average annual service firm formation rate of 2.26 per thousand of labor force, while the lower extreme averaged only a third as many new service firm formations, with 0.77 per thousand of labor force. Note that the list of LMAs with the highest birth rates appears to be almost evenly divided between very large LMAs and relatively small LMAs, but all the LMAs in the lowest birth rate group were relatively small.

Table 2b lists the LMAs with the largest and smallest populations in 1995. There is considerable variation in the birth rates of the large LMAs, varying from Miami FL with a birth rate of 2.52 new service firms per thousand of labor force down to Bridgeport CT with only 1.24. These 15 largest LMAs had an average new firm formation rate of 1.67, with an average corresponding three-year increase in employment of 4.68 percent. At the same time, the smallest 15 LMAs averaged only 1.00 new service firm formations per thousand labor force, with only half the rate of growth in employment. This raises the question, which we will address later, of whether larger places typically have other characteristics which account for their higher service firm formation and higher growth rates, or whether it is the larger size of these economic areas that contribute to their higher average rates of new service firm formation and employment growth.

3. WHY DO BIRTH RATES VARY ACROSS ECONOMIC AREAS?

It is clear from the previous section that the service firm formation rates vary greatly across local economic areas. Recently a growing literature has sought the determinants of such local variation in rates of new firm formation, and has identified a number of factors that contribute to these differences. The agglomeration effects that contribute to new firm formation can come both from demand effects associated with increased local population, income, and business activity, and from supply factors related to the quality of the local labor market and business climate.

Among areas with broadly similar regional demand and business climate characteristics, there are further differences in rates of new firm formation and economic growth that are associated with the specific qualities of their human capital, and the propensity of locally available knowledge to spillover and stimulate innovative activity which culminates in new firm formations. Highly educated populations provide the human capital embodied in their general and specific skills for implementing new ideas for creating new businesses. They also create an environment rich in local knowledge spillovers, which support another mechanism by which new firm start-ups are initiated and sustained. Thus, regions that are richer in educated people should have more start-up activity. Variation in local new firm formation rates should be positively related to local educational attainment rates. Furthermore, areas, which already have relatively intense development of service businesses, will have higher levels of service firm formations, resulting in large part from spillovers of relevant specialized knowledge. We would expect that areas with relatively high shares of high-school dropouts would have lower rates of new firm formation.

Lazear (2002) has contributed insights into one mechanism that contributes to the higher firm formation rates in larger cities, based on the presence of higher levels of individuals with a ‘career’ life-mode and a college education. Because their dominant value is the advancement of their career, although they are most likely to be working in large hierarchical private or public sector organizations, they will start their own businesses if this becomes the best way in which to benefit from their skills, knowledge and expertise. These businesses are often

technologically advanced, innovative and with good marketing capabilities. Career mode entrepreneurs are often concentrated in large metropolitan areas and smaller attractive cities. In fact, the 1990's saw an increase in the incidence of highly educated individuals starting new businesses, especially in the technologically advanced sectors of the economy, like computers, biotechnology, and internet-dependent businesses. However, there was also an increase in startups of many service businesses using relatively unskilled labor for services such as building cleaning, security, detective, and secretarial services. These may be started by career-oriented individuals who have recognized opportunities or developed new ideas to allow them to compete favorably in these markets, based on their own experiences or on spillovers from others.

New firm start-ups should be positively associated with higher levels of local human capital (including relevant knowledge spillovers):

(1) Firm Birth Rate $_{LEMt+2} = \alpha_L$ + ß Human Capital $_{L\,t}$ + ¬ [X] $_{Lt}$ + e $_L$

where X is a vector of control variables, the subscript $_L$ indexes LMAs, $_{EM}$ is the subsector, t refers to time and e is stochastic disturbance. The conditioning information set is a vector of exogenous population and business variables specific to each labor market area L.

4. EMPIRICAL MODEL

From the above discussion, it should be clear that the major hypotheses concerning the regional variation in firm formation rates deal with differences in levels of human capital and opportunities for spillovers, while controlling for local differences in a set of other regional characteristics which are likely to affect new firm formation rates. To test the basic hypotheses that the new firm formation rates are positively related to the level of human capital in a region, we estimate a regression model where the dependent variable is the average annual new service firm formation rate (dividing births by the labor force in thousands) for 1996-1998.[10] This is analogous to the method used by Keeble and Walker (1994) and Armington and Acs (2002). The explanatory (independent or exogenous) variables include those discussed below.

Independent Variables

To measure the level of human capital in each local economy we use two measures of educational attainment in each region, and a measure of the relative intensity of businesses in the same sector. The share of *college graduates* is defined as the number of adults with college degrees in 1990 divided by the total number of adults. This is a proxy measure that covers both technical skills needed in the economy, for example engineers and scientists, and skills needed to start and build a business, like finance and marketing and complex reasoning. In 1990, an average of 16 percent of the adult (at least 25 years old) population of the U.S. had a college degree,[11] but this varied from a low of 6 percent to a

high of 32 percent across LMAs. Its simple correlation with the new firm formation rates in LMAs is 0.29 and we expect it to be positively related to the birth rate, even after controlling for other important factors (Glaeser et al, 1995; Rauch, 1993; Simon and Nardinelli, 2002).

However, there are also arguments against this positive impact of higher educational attainment leading to higher new firm formation rates. Prior U. S. empirical work has presented rather convincing evidence at the individual level that, ceteris paribus, educational attainment levels are positively associated with new business formation (Evans and Leighton, 1990 and Bates 1991). But when regions are the unit of analysis, there is a credible contrary hypothesis. LMAs with a high proportion of the workforce having both high educational qualifications and managerial experience may be more likely to provide greater opportunities for individuals to obtain secure and rewarding employment with large firms, without having to take the risk of becoming an entrepreneur themselves.

The second measure of educational attainment that we use is the *high-school dropout* rate, defined as the percentage of adults (population 25 years or older) without college degrees who also do not have high school degrees in 1990. This high school dropout rate should be a good proxy for the proportion of unskilled and semi-skilled labor in the LMA, and should be negatively related to the birth rate. While many high-school dropouts are employed in some of the personal and business service activities, few of them have the skills to start and manage a new firm themselves. In fact, the simple correlation between the high-

school dropout rate and the new firm formation rate is –0.19. Nationally, 33 percent of non-college adults were high-school dropouts in 1990, and this varied from 17 to 60 percent across LMAs. However, there is a contrary argument similar to that above for college education, that areas with large shares of high-school dropouts will offer fewer employment opportunities for them, so they need to start businesses themselves in order to support themselves and their peers.

Formal education itself does not usually provide either the skills or the inspiration to start a new business. But higher education trains individuals to rationally assess information, and to seek new ideas. Therefore more educated people are more likely to acquire useful local knowledge spillovers from others who are involved in research or in managing some service business. The quantity of potentially useful knowledge spillovers is expected to be a function of the number of similar business establishments, relative to the population of the economic area. *Service-industry intensity* is defined as the number of service establishments in the region divided by the region's population in thousands. The greater the number of establishments relative to the population, the more spillovers should be facilitated due to density of establishments (Ciccone and Hall, 1996).

Regional Control Variables

The human capital variables whose impact we are analyzing are not the only explanation for differences among LMAs in new firm formation rates. We control for differences in a number of other regional characteristics, which are commonly

thought to influence the rates at which new firms are formed. Summary statistics are provided in Table 3 for the new firm formation rates, and for all of the regional socio-economic variables that are discussed above and below.

Population growth is the average annual rate of change in the local population in a previous period (calculating the two-year change from the ratio of, for instance for 1996-1998 firm formations, the 1995 population divided by 1993 population, and taking the square root of that two-year change ratio to calculate the annual change rate). Population growth captures the extent to which cities are relatively attractive to both migrants and immigrants, for living and for doing business. The growth in a region usually causes subsequent proportional growth in businesses which market to that region's consumers or businesses. This growth might take place either by expansion of existing businesses, or by creation of new businesses. A growing population increases the supply of potential founders of new businesses, and it increases the demand for consumer services.

Income growth is the average annual rate of increase of personal income in the region from 1993 to 1995, calculated using the same formula as for population. Income growth in excess of population growth captures local growth in labor productivity, and concomitant increases in local average quality of life. Two different mechanisms contribute to the expectation that areas with faster growing incomes would have higher rates of new firm formation. The first is that wealthy areas are more likely to have higher disposable income, leading to greater demand for a wider range of income-elastic services. Secondly, this

higher income growth rate enables potential new business founders to raise capital more easily at lower cost, thereby facilitating new firm formation. Higher levels of either or both of these growth factors for the preceding period are expected to promote higher new firm formation rates (Reynolds, 1994).

We control for agglomeration effects in each region by including the log of population as a control variable, because we expect proportional differences in population to impact the new firm formation rates (rather than absolute value differences). Agglomeration effects are expected to have a positive impact on the start-up rate. Lucas (1993) asserts that the only compelling reason for the existence of cities would be the presence of increasing returns to agglomeration of resources, which make these locations more productive. However, agglomeration effects may be more complex, and have effects that vary across different types of service sub-sectors.

The *unemployment rate* is calculated for the two-year period prior to our start-up measurement period – for example, the average number of unemployed in 1994-1995 divided by the labor force in 1994. Audretsch and Fritsch (1994), and Armington and Acs 2002 have used this measure with sometimes conflicting results -- it is not clear whether the relative impact of local differences in unemployment rates is negative or positive. The simple correlation between the unemployment rate and the firm birth rate is close to zero and is not statistically significant. The unemployment rate has been traditionally used as a measure of local economic distress, which would suggest it serves primarily as an indicator of local business health, so that higher unemployment should be associated with

fewer new firm formations. In many studies of new firm formation in the 1980s, there was a heavy emphasis on the possible positive explanatory power of unemployment (Evans and Leighton, 1990, Storey, 1991). Unemployment had then increased significantly in several countries and stayed at very high levels over an extended period. It was suggested that when workers were unemployed they might be more likely to start their own businesses. This activity, in turn, might reduce the unemployment rate as the resulting new firms employ not only the owners, but also others. This effect of unemployment may dominate in the service industries, with its generally lower capital requirements.

All-Industry intensity is the total number of private sector establishments in the region, divided by the region's population. Some prior studies have attempted to assess the potential for positive effects from spillovers using population density, or establishment density, the number of units per square mile. Such measures, however, are more indicative of physical crowding than of communication opportunities. Therefore, we introduce this new measure that captures the general business intensity of an area, relative to its population. density and the number of establishments in a region. It may also be thought of as the ratio of an area's business density (establishments per square mile) to its population density (people per square mile). The all-industry intensity variable serves to control for differences in crowding of businesses, relative to the population. Since we have already taken into consideration the local intensity of establishments in the service sector, we expect that the greater the density of all

establishments, the lower the service firm formation rate will be (Acs, FitzRoy and Smith, 2002).

Establishment size is a proxy for the broad structure of business in the region. It is measured as 1994 all-industry employment divided by the number of all-industry establishments in 1994 in the region. A local business structure with no dominant large firms may offer fewer barriers to entry of new firms. Furthermore, where small firms predominate in a geographical area there is a much broader population of business owners, and more individuals may visualize their own careers as leading to the founding of independent new firms. Thus the average size of area establishments should be negatively related to the new firm formation rates, since larger average size indicates greater dominance by large firms or branch plants (Armington and Acs, 2002).

Of course, some of these control variables may in fact be endogenous to, or at least correlated with, other variables. Although income and population growth was measured for a previous two-year period, such regional differences are likely to persist over time, and future growth differences certainly result from current differences in startup rates. In fact, much of the economic geography literature today is concerned with cumulative growth mechanisms in which cause and effect appear to be simultaneous. [12]

5. EMPIRICAL RESULTS

Table 4 shows the results of least squares regression on the 1990-1992, 1993-1995 and 1996-1998 average annual firm formation rates for the service sector

for 394 Labor market Areas. We present standardized beta coefficients[13], so that each parameter indicates the sensitivity of birth rate variation to normalized variation in the corresponding independent variable. The t-ratios shown for each were calculated from the simple estimated standard errors. These were also calculated with a correction for heteroscedasticity, and these results were very similar to the uncorrected standard errors. The estimated coefficients are generally consistent with our expectations, but with several important exceptions. The explanatory and control variables together explain about two-thirds of the regional differences in new service firm formations rates.

Only two of the three human capital variables showed the hypothesized relationships. First, for human capital measured by share of college graduates, the coefficients are positive and statistically significant for all except the 1993-95 periods, confirming that regions with higher shares of college-educated adults have higher firm formation rates. This positive result on human capital is consistent with previous research (Storey, 1994).

The positive and statistically significant coefficient for high-school dropouts as a share of the non-college adult population is at first surprising -- however it is consistent with our earlier results for the whole economy (Armington and Acs, 2002). There we suggested that after controlling for the proportion of adults with college degrees,[14] the additional effect of a greater share of less educated workers is to facilitate the startup-up process by providing cheap labor for the new firms. Even the most sophisticated businesses need some workers who are less educated to do the manual labor. Thus, the relationship between

educational attainment and new firm start-ups at the regional level may be U-shaped, with both low levels and high levels of education conducive to firm formation and growth.

Thirdly, the coefficient on intensity of service establishments is positive and statistically significant, suggesting that regions that already a relatively strong supply of service establishments will have higher rates of new service firm formation, as predicted by the theory of regional spillovers (Jovanovic and Rob, 1989). Indeed, this factor has the strongest relationship of any of our independent variables. The 0.60 value estimated for the standardized coefficient indicates that a locality with a service establishment intensity that is one standard deviation more intense than the mean will be likely to have firm startup rates that are 0.6 standard deviation higher than the mean. When we tried replacing this measure of service establishment intensity with the share of employment in services, the estimates were much weaker, so we conclude that it is important that the local service sector have many establishments, rather than many employees with service experience. Furthermore, once we control for the intensity of service establishments, the additional intensity of all establishments is negatively related to service firm formation. This suggests that start-ups are facilitated by spillovers from clusters of similar establishments, but that a relatively high intensity of other types of establishments actually discourages new service firm formation. Crowding, in general, does not lead to higher rates of service firm start-ups. These results are interesting because they shed additional light on the debate between diversity and specialization (Glaeser, 1992). They

suggest that spillovers have important positive effects within broad industry sectors, but do not play an important positive role across sectors. These results are consistent with Acs, FitzRoy and Smith (2002) who found no spillovers across unrelated industries.

Note also that the coefficient on the unemployment rate is positive and statistically significant for 1990-1992, when the economy was undergoing a small recession. However, it is negative and barely significant during 1993-1995 and insignificant during 1996-1998, suggesting that this positive effect disappears as the economy improves, or as mean unemployment falls. These results are inconsistent with some previous research (Storey, 1991) that generally found a negative relationship between unemployment and start-ups in a cross sectional analysis. While the implication here is that during recessions workers shift from being employed to unemployed, the overall entry rate in the region tends to go up slightly, although there is no direct evidence that the formerly unemployed workers were the ones starting the new businesses. Moreover, the service firm formation rate during the period with the 1991 recession was slightly lower that in more expansionary periods.

The signs on the other control variables are as expected. Local population growth differences had the strongest association with new firm formation rates. Regions that have higher per capita income growth, higher levels of agglomeration and lower average firm size grow faster. Our results are generally robust for the three different periods.

6. SUBSECTORS WITHIN THE SERVICE INDUSTRY

Hoping to better distinguish the impacts of our independent variables on the startup rates of various types of service activities, but limited by data disclosure constraints, we defined 9 service subsectors, using two dimensions that should be relevant to our analysis of variation in startup rates. The dimensions chosen were the market segment served and the customary education requirement for founder of new firms in each class of service activity. Each of these dimensions was broken into just three categories, so that applying both dimensions resulted in the classification of all services into nine subsectors, within which the service activities were fairly homogeneous with respect to these two dimensions.

The most obvious reason for variation across locales in their rates of new service firm startups is variation in local demand for services, so we distinguished three general markets – local consumers, local businesses, and non-local (broader regional, national, or export) markets. Each four-digit Standard Industrial Classification code was assigned to one of these market segment categories, based on close reading of the descriptions of the activities within the definition of the code. It was expected that a substantial portion of the variation in startups of local consumer service firms would be associated with variation in recent increases in population. Similarly, it was expected that locales with relatively high numbers of businesses (intensity relative to the population) would be associated with higher rates of local business service firm formations. New service firms serving a broader, non-local market should be considerably less

sensitive to these local market differences. Thus, this dimension improves the control of local variation in demand for new service firms.

A major factor affecting the supply of new service firms is the availability of individuals with the qualifications generally needed to recognize the opportunities, identify new services, markets, or delivery systems, organize the new firm, and hire the first employees. We therefore expected that the relative supply of adults with various levels of education would be associated with the variation in new service firm formations in sub-sectors typically founded by entrepreneurs with those levels of education. We distinguish activities that are most frequently started by people who do not have college degrees (called 'high school' level for simplicity), from those generally requiring an 'advanced' (graduate, post-graduate, or professional) degree, and assigned the remainder to 'college.' These allocations were based on subjective judgements, using our general knowledge of service industries, supplemented by detailed descriptions of the 4-digit SIC classes in the 1987 Standard Industrial Classification Manual.[15] The resulting subsector classifications for each 4-digit SIC are listed in the Appendix, where they are ordered by SIC code within each sub-sector. Data on the number of establishments and employees in each 4-digit SIC in 1995, and their net changes to 1998, as well as the total number of new firm formations during 1996 through 1998 per hundred (1995) establishments, are provided for each entry in this table.[16]

Table 5 shows average annual firm formation rates and shares of total service employment for the nine services-sub-sectors defined according to their

market segments and founders' education requirements. Looking first at the new firm formation rates by education requirement, note that they are quite similar for all three categories, ranging only from 8.33 for advanced degrees, up to 9.29 for those types of service industry businesses that are probably founded by individuals with only a high school education. But when we segment the service sector by market, we find that the firm formation rate for service businesses that focus on local consumer markets (which account for about 55 percent of employment in services) is only 7.18 new firms per hundred establishments in that market category. At the other extreme, the segment of services that caters to non-local markets had 12.66 new firms per hundred existing establishments (but accounts for only 19 percent of employment in services).

For the nine sub-sectors defined by the education requirement and the market segment together, the firm formation rate was highest, at 14.78, for businesses in non-local markets with founders normally having advanced degrees. The sub-sector requiring the same advanced degree for founders, but serving the local consumer market, had only 5.31 new firms for each hundred existing establishments in that sub-sector. For businesses that normally require a college degree for their founder, the birth rate is quite similar across all three of the market segments. Businesses requiring less educated founders (high school degree) also showed great variation across market segments, with high formation rates for non-local market, and low ones for the local consumer market.

The first subsector regression model reported in Table 6 is a simple pooled regression on average new firm formation rates for 1996 through 1998,

where each observation is a subsector in an LMA. Thus, there are 3546 observations, from each of the nine subsectors in each of the 394 LMAs. If we use $_L$ to indicate LMA and $_{EM}$ to indicate subsectors distinguished by Education and Market, we can specify this model as follows:

(2) Birth rate$_{LEM}$ = f (Coll $_L$, HighSch Drop $_L$, Subsector estab intensity $_{LEM}$, Pop gro $_L$, Income gro $_L$, Pop log $_L$, Unempl $_L$, Estab Size $_L$, All-ind estab intensity $_L$).

Most coefficients fall somewhat, relative to the all-service model results shown in the first column (repeated from Table 4), suggesting that the independent variables are not equally important to all of the subsectors. The coefficient on the all-industry establishment intensity falls substantially because it had been elevated as a result of some collinearity between the service industry intensity and the all-industry intensity, but there is much less multi-collinearity between the service subsector intensity levels and the all-industry intensity. Using the more detailed subsector birth rates and subsector intensity rates also reduces the adjusted R-squared, because some of the additional variation in birth rates across subsectors is not as well explained.

Obviously, the problem with this simple pooled subsector model is that it does not allow different subsectors to have differences in their relationships to the exogenous variables. When we discussed the reasons for defining those subsectors, we focused on some expected differences in their coefficients with

some of these variables. Each subsector model could be separately estimated, but that would not restrict the coefficients on the locality variables that we expect to be unaffected by subsector differences. Alternatively, we could estimate the model separately for each of the dimensions – education and markets. But that fails to make use of the information we have on how these LMAs differ on both dimensions simultaneously, so the results would be subject to aggregation errors, which could be avoided by making use of the lost information.

In order to allow for variation in the estimated coefficients of variables that should be sensitive to our sub-sector dimensions, while controlling consistently for other regional characteristics, we expand the independent variables to be subsector-specific for the dimensions we want to test. Naturally, we expected the educational attainment variables to be sensitive to the Education requirement dimension. We also wanted to investigate how the intensity of existing establishments in each subsector affected the rate of new firm formation in different market segments. We anticipated that subsectors that differed in education requirement might differ in their relationship to income growth rates and unemployment rates. Market segment was expected to affect how the startup rate varied with population growth, the average size of local establishments, and the intensity of all business establishments in the locality. As mentioned earlier, we added the log of population because we found that we were systematically underestimating growth rates in the largest LMA's, and we therefore had to accept that they were being impacted by an agglomeration effect that was not being represented adequately by our other variables. Since little is

known about this residual agglomeration effect, we did not try to anticipate whether it would be sensitive to Market segment or Educational requirement, and therefore tested it with both dimensions.

Using the previous notation, this more detailed pooled estimation model has the following form:

(3) $\text{Birth rate}_{LEM} = f(\text{Coll}_{LE}, \text{HighSch Drop}_{LE}, \text{Subsector estab intensity}_{LEM}, \text{Pop gro}_{LM}, \text{Income gro}_{LE}, \text{Pop log}_{LEM}, \text{Unempl}_{LE}, \text{Estab Size}_{LM}, \text{All-ind estab intensity}_{LM})$.

In order to estimate this model, we first standardized all of the exogenous and endogenous variables to have a mean of zero and a standard deviation of one, within each of the nine subsectors. Therefore, each represents a relative measure for the LMA, within the subsector. Then we created dummy variables for each of the three values for each of the sub-sector dimensions – Market and Education. Finally, we multiplied each exogenous variable times the appropriate dummies to create specialized exogenous variables that distinguished among the dimensions we wanted to test for differences in estimated coefficients. The results of the estimation of this model are shown in the last six columns of Table 6.

Looking first at the human capital variables in the estimated model whose coefficients are shown in the last 6 columns of Table 6, we see that the share of adults with college degrees is not significant for the formation rate of service

businesses requiring only a high school education for the founder. For services businesses requiring a college education, the variation in the local formation rates is much more sensitive than was indicated by either the all-service regression or the pooled sub-sector regression. There is also a significant positive relationship between the share of adults with college degrees and the formation rates of service businesses normally requiring an advanced degree for the founder. This results from the high correlation of the distribution of college degrees with that of advanced degrees.

The positive and statistically significant coefficient for the relationship of shares of high-school dropouts to formation of new service firms that require advanced degrees suggests that such businesses may be more dependent on having a large pool of unskilled labor. The statistically insignificant coefficients for the impact of the share of high school dropouts on formation rates in the sub-sectors of services that require only high school or college degrees suggests that such businesses are not as sensitive to the supply of unskilled labor. They may find that the unskilled labor supply in most areas is adequate for their needs.

The relative intensity of establishments in the same sub-sector of services is a significant explanatory variable for all market segments, but the formation of new firms serving non-local markets is particularly sensitive to the prior existence of similar businesses. This corroborates the many prior case study analyses that addressed the spillover effects of certain rapidly growing local industry clusters, and suggests that these spillover effects are particularly important for businesses that are not focusing on local markets.

Most of the estimated coefficients for regional characteristics crossed with education or market dummies were similar to those estimated without such distinctions. However, the differences that appeared are quite illuminating. The log of population was crossed with all six dummies, and the tiny and insignificant variables crossed with College degree and with Non-local markets were later omitted, to strengthen the remaining estimates. These show that, unlike services to local markets, those to non-local markets are not sensitive to the size of the local economic area. Perhaps the high coefficient on sub-sector intensity for non-local services has captured all of the relevant agglomeration effects for that sub-sector. Distinguishing by the education dimension, larger population contributes a bit to the formation rate of services firms requiring founders with advanced degrees, but it reduces the formation rate of firms normally started by high school dropouts.

The coefficient on unemployment is positive and statistically significant only for service firms normally started by college graduates. This provides some clarification of the conflicting results found in previous studies of the effects of unemployment levels on new firm formation rates. Apparently, after controlling for regional differences in income growth rates, an increase in unemployment tends to lead to an increase in new firm formation by those with college degrees, but not by high school dropouts or those with advanced degrees.

Finally, the negative coefficient on average size of local businesses is strongest for formation of new firms serving local consumer markets, while that

on the intensity of all establishments is significant only for formation of new firms serving non-local markets.

These results suggest that the regional differences in new firm formation rates do indeed depend to a large degree on the educational requirements and the market served by the newly formed firms. In particular, the local levels of educational attainment impact primarily the firm formation rates of the types of firms that are normally founded by better educated entrepreneurs, and do not affect startup rates for those normally founded by individuals with less that a college degree. While formation rates of all service businesses are higher in areas with higher intensities of similar service establishments, new formations of firms serving non-local markets are three times more sensitive to this than those serving local consumer markets, and those serving local business markets are twice as sensitive as those serving local consumers.

7. SURVIVAL AND FAILURE OF NEW FIRMS

In this section, we ask a different question than in the previous section. That is, does the level of human capital in a region have a different impact on the region's rate of successful new firm formation than on its rate of unsuccessful firm formation? Can we identify factors that contribute more to the formation of firms that fail within their first three years, than to firms that survive their first three years? This is an important question because new firm formation is generally not an end in itself, but is promoted for its contribution to economic growth. The new

firms that fail quickly contribute little to a local economy beyond temporary disruption.

While there has been very little research on firm survival differences at the regional level, it has been examined carefully in the contest of industrial organization studies (see, for example, Geroski 1995). What we know from the industrial organization literature is that small scale, de novo entrants have a relatively short life expectancy. That is, new firm formation appears to be much easier than the continuing survival of a new business. While the traditional literature has focused on entry barriers, it is difficult to reconcile the theoretically high entry barrier concept with the actual high entry rates. If, however, barriers to entry are thought of as obstacles that prevent firms from surviving long in the market, then the data present less of a puzzle. Audretsch (1995) found that indeed scale economies and product differentiation do constitute barriers to survival, but these can be overcome when firms innovate and learn how to survive.

Two conflicting hypotheses can be put forward with regard to the role of the education level of the entrepreneur in influencing business survival. One argues that education provides a basis for intellectual development, which the entrepreneur requires to be in business successfully, and that higher levels of education provide the individual with greater confidence in dealing with customers and suppliers. In short, this approach says that education is an essential constituent of the human capital needed for business success. The converse argument is that business ownership is not an intellectual activity.

Instead, entrepreneurship is an opportunity for the less academically successful to earn high incomes. It may even be that individuals with the high academic attainments are likely to be insufficiently challenged by the many mundane tasks associated with business ownership. Storey (1994) cites empirical evidence from seventeen studies, of which nine found no relationship between education and survival, while the other eight showed some form of positive relationship at the individual level to firm survival. While location may not play a specific role in the survival of individual firms, the general consensus is that location influences the overall probability of survival. In fact the new sociology suggests that regions and networks may be more important for growth and survival of entrepreneurial firms than individual initiative (Thornton, 1999, and Littunen, 2000).

The data for this study were constructed to facilitate analysis of the relationships between local differences in new firm formation rates and various characteristics of economic areas, including the human capital. While these data are not suitable for analyzing the impact of the different aspects of the individual, the firm and the regional economy on the survival probabilities of new firms, they are suited to a more limited goal. We test whether the human capital factors that we have used to help explain local differences in formation rates of service firms relate differently to formation rates of successful businesses than to formation rates of businesses that close within three years. More specifically, we hypothesize that the formation rates for successful businesses are more strongly related to our human capital variables than the formation rates for businesses that close quickly.

Table 3 includes summary statistics for new firms surviving three years, and for new firms closing within three year of their formation, for service firms that were formed during two periods -- from 1990 to1992 and from 1993 to1995. The annual average number of surviving new firms was about 0.8 per thousand labor force, which is about 63 percent of all new service firm formations. In other words, nearly two-thirds of the new service firms survived at least three years, while the other third failed before their third year. This ratio was little different for the 1990 to 1992 period, which encompassed a small recession, and the 1993 to 1995 period, with its recovery and rapid growth.

Table 7 presents estimates of the same model used in Table 4, but estimating the coefficients separately for the surviving firm formation rates and the closing firm formation rates, again using all 394 LMAs as our units of observation, for two consecutive time periods. We again present standardized beta coefficients so that each parameter indicates the sensitivity of survival rate variation to normalized variation in the corresponding independent variables.

Naturally, the coefficients estimated for Survivors and Closed formation rates can be averaged to get the coefficients estimated for the sum of these two variables, which is found in Table 4. But these coefficients do not show the hypothesized pattern of human capital factors having stronger relationships to the surviving formations than to the closed formations. Looking first at the two sets of coefficients for surviving and closed firms that were formed in 1993 to 1995, we note that the share of adults with college degrees, has no significant relationship with the formation rates of closed businesses, while this relationship

is stronger for surviving businesses than it was for all new service firm formations. The coefficient for the share of high school dropouts is also positive and statistically significant, with a stronger relationship to closed formations than to surviving formations. This stronger association of dropout rates with failed formation rates suggests that people that start businesses without adequate education are more likely to fail. This supports the finding of Bates (1997, p.1). In that author's words,

> "People most likely to pursue self-employment are highly educated and skilled, often possessing significant personal financial resources. Likewise, those lacking the requisite skills and capital, whether immigrants or otherwise, are unlikely to start small businesses. Among people who choose self-employment without appropriate education, skills and financial resources, business failure and self-employment exit rates are high. "

However, the estimated coefficients for 1990 to 1992 new firm formation rates show share of adults with college degrees having a stronger relationship to the rate of failed formations than to the rate of surviving formations. Could it be that higher shares of college degrees lead during recessions to higher rates of formation of new firms that fail, while during growth periods there is no such relationship? Further research is needed to resolve this question.

The coefficient on the intensity of service establishments is also slightly higher for new formations that fail than for those that survive, suggesting that the knowledge spillovers and networking that are facilitated by greater intensity of similar businesses are more important to the formation of businesses that fail quickly . This relationship is consistent over both of our available time periods.

Most of the variables controlling for other differences in regional characteristics show little difference in estimated coefficients for the surviving formations and the closed formations, and for the two time periods. However, the unemployment rate coefficients remain negative for the growth period and positive for the recession period. It appears that during that recession, areas with higher unemployment rates contributed to higher rates of formation of both surviving and closing businesses. But the coefficient on unemployment for surviving new businesses in the growth period is not statistically significantly different from zero, while that for closed formations is strongly negative and significant.

7. CONCLUSIONS

This paper has used a model of geographic variation in firm birth rates, focusing on their relationship to local human capital and the potential for knowledge spillovers from existing similar businesses. A key variable for the firm birth rate, as for economic growth, both within cities and within countries, is the educational attainment of the labor force. Although the actual knowledge acquired with a college degree seldom suffices as the basis for a successful new business, the analytical methods learned in college facilitate both future acquisition of knowledge and openness to new ideas received as spillovers from other activities in the area. Indeed, after controlling for basic differences in the underlying rates of population growth, the strongest factor accounting for differences in new firm formations was the local intensity of other similar

businesses in the area. These results suggest that higher education influences later growth through the increased discovery and implementation of innovative ideas, resulting in more new firm formations.

In addition to the positive impact of higher proportions of adults with college degrees on rates of new firm formation, we also found an additional positive impact of higher proportions of high school dropouts among the non-college-educated portion of the adult population. However, when we examined this for various sub-sectors of the service sector, we found it to be strong only for service activities that normally are started and managed by persons with advanced degrees. Therefore that coefficient must indicate a stronger tendency to start such businesses in areas that have relatively more unskilled (or cheap) labor.

Population growth was the most important of the regional characteristics used to control for other area differences that were likely to affect new firm formation rates. The unemployment rate appears to be unimportant except in years of recession, when higher unemployment rates contribute to higher firm formation rates.

We had expected that the estimated coefficients of the model explaining area differences in the rates of formation of firms that survived at least three year would differ from those for firms that closed within three years. However, we found no clear differences across these two types of new firms.

Many of the most interesting explanations for the connection between growth and human capital levels across countries have focused on productive

externalities generated by schooling. The potential for these externalities differs greatly across cities in the U.S., depending on both the levels of education of their work force, and on the strength of the presence of existing businesses in the same industry sector. It appears that an important mechanism by which these externalities contribute to economic growth in cities is through their impact on the level of entrepreneurship. And entrepreneurship provides the catalyst for increasing productivity, as well as increasing diversity and volume of goods and services produced in an area.

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Table 1: Gross Formation and Net Births of Service Firms by Year, 1990 to 1998, and Service Firm Formation and Employment as a Share of All Industry

	Service Firm Births		Service Firm	Service Share of All Industry	
	Gross	Net	Gross Formation		
Year	Formation	Births	Rates per thou LF	Formation	Employment
1990	170,345	24,521	1.375	35.1%	28.3%
1991	173,475	24,928	1.378	37.1%	29.2%
1992	167,266	20,140	1.324	37.0%	29.8%
1993	174,884	28,546	1.365	36.7%	30.6%
1994	177,743	27,481	1.376	36.7%	30.9%
1995	186,050	33,220	1.421	36.9%	31.1%
1996	192,018	31,812	1.452	37.9%	31.4%
1997	194,916	19,936	1.452	39.0%	32.1%
1998	191,911	na	1.445	38.4%	32.8%

Note: Gross formation includes all new service firm formations in each year.
Net births are the excess of firm formations over firm closures each year.

Table 2a: Regional Variation in LMA Sizes and Service Firm Formation Rates, 1996-1998 ranked by Annual Average Service Firm Formations per thousand 1995 Labor Force

Top 20 LMA's, average of **2.26** Service Firm Formations per year per 1000 labor force

LMA	Largest Place	State	Avg 1996-98 Formation Rate	Service Firms '95	1995 LaborForce	1995 Population
287	Laramie	WY	3.276	2,250	90,242	157,260
71	West Palm Beach	FL	2.790	12,791	602,263	1,320,841
72	Cape Coral	FL	2.598	4,845	251,563	555,042
70	Miami	FL	2.517	36,811	1,794,995	3,559,134
393	Bellingham	WA	2.362	2,244	114,745	248,175
69	Sarasota	FL	2.316	5,704	280,316	677,113
344	Bozeman	MT	2.280	2,255	113,581	214,480
376	Reno	NV	2.260	4,421	254,723	489,925
345	Missoula	MT	2.211	2,398	126,036	255,454
91	Atlanta	GA	2.188	26,826	1,746,367	3,159,274

352	Grand Junction	CO	2.140	1,628	92,686	180,242
289	Denver	CO	2.135	20,972	1,241,321	2,116,579
359	St. George	UT	2.105	1,037	82,660	185,658
353	Farmington	NM	2.076	1,137	73,850	145,934
354	Flagstaff	AZ	2.065	2,173	139,112	288,115
379	Las Vegas	NV	2.060	7,083	613,097	1,178,223
75	Daytona Beach	FL	2.025	3,614	217,087	517,867
74	Orlando	FL	2.014	11,732	763,432	1,423,362
67	Tampa	FL	2.007	18,150	1,090,154	2,174,602
392	Bend	OR	1.991	1,492	95,114	187,506

Bottom 20 LMA's, average of **0.77** Service Firm Formations per year per 1000 labor force

LMA	Largest Place	State	Avg 1996-98 Formation Rate	1995 Firms	1995 LaborForce	1995 Population
151	Lorain	OH	0.803	2,505	211,001	417,376
139	Kokomo	IN	0.800	1,153	95,821	183,584
133	Findlay	OH	0.794	1,553	128,032	245,284
225	Appleton	WI	0.793	3,497	316,960	518,380
224	Sheboygan	WI	0.785	1,147	106,522	190,707
183	Watertown	NY	0.777	1,248	105,549	257,062
227	Wausau	WI	0.773	2,178	195,815	359,420
187	Sunbury	PA	0.773	1,135	89,741	192,916
181	Elmira	NY	0.772	2,149	167,177	350,349
128	Greensburg	IN	0.767	658	69,562	130,547
182	Olean	NY	0.767	1,378	112,608	241,924
134	Lima	OH	0.764	1,679	132,715	261,596
6	North Wilkesboro	NC	0.757	766	74,383	144,671
185	Amsterdam	NY	0.757	652	53,750	111,218
154	Zanesville	OH	0.756	1,033	85,927	184,493
237	Galesburg	IL	0.734	878	70,347	147,675
219	Marshalltown	IA	0.708	725	59,299	110,541
178	Oneonta	NY	0.673	996	75,827	160,694
218	Mason City	IA	0.672	1,156	81,392	150,274
126	Richmond	IN	0.662	713	55,891	105,835

Table 2b: Regional Variation in LMA Sizes and Service Firm Formation Rates, 1996-1998
Largest and Smallest Labor Market Areas, ranked by 1995 population
withformation rates in average annual service firm formations per thousand 1995 labor force

Largest 15 LMAs

				Services		
	Largest Place	State	1995 Population	Avg 1996-98 Formation Rate	Avg 1995-98 Empl. Change	Services Firms '95
383	Los Angeles	CA	15,273,490	1.61	4.91%	109,555
194	New York	NY	10,974,248	1.85	3.75%	93,034
243	Chicago IL	IL	7,687,064	1.45	3.91%	58,924
113	ArlngtnWashBalt	VA	5,738,252	1.61	4.82%	59,517
196	Newark	NJ	5,488,581	1.79	4.09%	50,249
197	Philadelphia	PA	5,424,998	1.35	3.05%	41,508
116	Detroit	MI	5,258,367	1.26	3.65%	36,185
205	Boston	MA	4,727,659	1.53	3.21%	40,779
378	San Francisco	CA	4,335,465	1.88	6.06%	39,967
320	Houston	TX	4,007,275	1.61	5.44%	28,919
70	Miami	FL	3,559,134	2.52	4.00%	36,811
394	Seattle	WA	3,470,732	1.79	5.47%	28,764
209	Bridgeport	CT	3,432,869	1.24	3.54%	30,209
91	Atlanta	GA	3,159,274	2.19	6.78%	26,826
331	Dallas	TX	2,861,201	1.88	7.44%	23,953
	Average of 15 largest			1.67	4.68%	

Smallest 15 LMAs

				Services		
	Largest Place	State	1995 Population	Avg 1996-98 Birth Rate	Avg 1995-98 Empl. Change	Services Firms '95
148	Vincennes	IN	112,611	0.99	2.89%	782
253	Union City	KY	112,257	0.90	3.91%	651
283	North Platte	NE	111,929	1.11	2.24%	1,002
273	Fairmont	MN	111,436	0.95	1.09%	977
185	Amsterdam	NY	111,218	0.76	1.82%	652
219	Marshalltown	IA	110,541	0.71	-0.70%	725
266	Aberdeen	SD	109,103	1.17	0.64%	968
327	Brownwood	TX	107,861	1.20	3.79%	751
126	Richmond	IN	105,835	0.66	-0.40%	713
291	Salina	KS	105,237	1.14	1.48%	920
258	Blytheville	AR	105,214	0.98	8.95%	524
245	FortLeonardWood	MO	104,561	1.36	2.84%	673
101	Thomasville	GA	104,131	1.19	8.29%	641
324	Big Spring	TX	103,279	1.07	3.07%	657
212	Hutchinson	MN	103,042	0.97	-5.04%	742
	Average of 15 smallest			1.00	2.32%	

Table 3: Summary Statistics on Dependent and Independent Variables for Regressions

Observations are 394 Labor Market Areas, covering entire USA

	Mean	Std Dev.	Minimum	Maximum
Avg. Ann. Service Firm Formations per 1000 labor force				
All births				
1996-1998	1.269	0.371	0.662	3.276
1993-1995	1.275	0.352	0.688	3.327
1990-1992	1.233	0.337	0.692	2.785
Births surviving at least 3 years				
1993-1995	0.804	0.205	0.454	2.174
1990-1992	0.786	0.196	0.428	1.808
Births dying within 3 years				
1993-1995	0.471	0.156	0.204	1.153
1990-1992	0.447	0.150	0.143	1.111
Independent variables				
Human Capital in 1990				
College Degree, % of adults	0.159	0.050	0.069	0.320
High-school Dropouts, % of non-college adults	0.329	0.082	0.167	0.598
Intensity of Serv Estab / Population (000), 1995	7.620	1.400	3.755	15.548
Regional characteristics				
Population Growth ratio, 1993-95 avg	1.010	0.010	0.989	1.059
Per capita Income Growth ratio, 1993-95 avg.	1.040	0.013	0.969	1.084
Log of population, 1995	12.801	0.940	11.543	16.542
Unemployment Rate, 1994-95 avg.	0.060	0.024	0.020	0.290
Avg. Employment per establ., all-industry, 1994	15.097	2.881	8.266	21.237
Intensity of Establ. / Popul. (000), all-ind., 1994	21.834	3.584	10.774	45.105

Table 4: Regression Coefficients for Service Firm Formation Rates in Labor Market**

Areas during three consecutive time periods

(standardized betas with t-ratios below, significant at .05 or better unless starred*)

	1996-98	1993-95	1990-92
Adj. R sqd	.718	.658	.625
Human Capital			
College degree, % of adults '90	**0.16**	**0.10***	**0.19**
	3.39	1.79	3.40
High-school dropout, % of non-college adults '90	**0.16**	**0.21**	**0.14**
	4.21	4.86	3.20
Intensity of service estab/population	**0.63**	**0.60**	**0.47**
	6.53	5.63	4.26
Regional Characteristics			
Population growth	**0.51**	**0.46**	**0.41**
	18.05	14.44	11.46
Per capita income growth	**0.09**	**0.19**	**0.13**
	3.03	5.62	3.77
Population (logarithm)	**0.22**	**0.16**	**0.18**
	4.92	3.25	3.6
Unemployment rate	**0.06***	**-0.09**	**0.17**
	1.64	-2.32	4.08
Avg. size of all establ (employment)	**-0.34**	**-0.33**	**-0.32**
	-8.06	-8.13	-7.30
Intensity of all estab/population	**-0.21**	**-0.07***	**-0.03***
	-2.42	-0.71	-0.31
n	394	394	394

** Birth rates are 3-year average births per 1000 labor force in prior year

Undated exogenous variables represent prior year, or prior 2 year averages

Table 5: 1996-98 Avg. Ann. Birth Rates and Relative Size of Service Sub-sectors
defined by Market Segments and Founder's Education Requirement

Education Requirement and Market Segment	Firm births per 100 estab in subsector	Share of services 1995 employment
All services	8.84	100.0%
All education classes		
Local business market	10.66	26.1%
Local consumer market	7.18	54.9%
Non-local markets	12.66	19.0%
High school		
All markets	9.29	30.4%
Local business	12.22	9.3%
Local consumers	8.42	15.9%
Non-local markets	7.86	5.2%
College degree		
All markets	9.25	26.1%
Local business	8.60	10.2%
Local consumers	9.08	13.6%
Non-local markets	10.72	2.3%
Advanced degree		
All markets	8.33	43.5%
Local business	10.31	6.6%
Local consumers	5.31	25.4%
Non-local markets	14.78	11.5%

Table 6: Standardized Regression Coefficients for Service firm births per thousand labor force in Labor Market Areas during 1996-1998 by Education Requirement and Market Segment, with all variables expressed as deviations from mean values for all LMA's in subsector
(betas with t-ratios below, significant at .05 unless starred*)

			Pooled, with Dummy-distinguished exogenous vbls.					
	All	Pooled 9	Educational Requirement			Market Segment		
	Services	Subsectors	High School	College Degree	Advanc'd Degree	Local Busn	Local Consum.	Non-local
Adj. R sqd	.718	.566			.660			
Human Capital								
College degree, % of adults '90	**0.16**	**0.14**	**0.01***	**0.21**	**0.11**			
	3.39	7.47	0.41	8.09	4.02			
High-school dropout, % of non-college adults '90	**0.16**	**0.09**	**0.03***	**0.04***	**0.16**			
	4.21	5.77	1.26	1.91	6.85			
Intensity of subsector, establ /popul	**0.63**	**0.54**				**0.53**	**0.25**	**0.77**
	6.53	36.40				18.55	9.25	32.05
Regional Characteristics								
Population growth	**0.51**	**0.36**				**0.35**	**0.44**	**0.20**
	18.05	32.09				19.43	22.83	11.19
Per capita income growth	**0.09**	**0.07**	**0.06**	**0.08**	**0.06**			
	3.03	5.96	3.35	4.44	3.28			
Population (logarithm)	**0.22**	**0.16**	**-0.06**		**0.06**	**0.23**	**0.20**	
	4.92	9.18	-2.35		2.18	7.81	7.50	
Unemployment rate	**0.06***	**0.05**	**0.01***	**0.05**	**0.02***			
	1.64	3.23	0.47	2.54	1.15			
Avg. size of all establ (employment)	**-0.34**	**-0.26**				**-0.17**	**-0.47**	**-0.14**
	-8.06	-16.04				-6.87	-19.79	-6.36
Intensity of all estab/popul.	**-0.21**	**-0.06**				**-0.01***	**-0.02***	**-0.07**
	-2.42	-3.59				-0.2	-0.74	-2.96
n	394	3546			3546			

Table 7: Regression Coefficients for Birth Rates* of Service Firms that Survive at least 3 years and of Service Firms that Close before 3 years

(standardized betas with t-ratios below, significant at .05 unless starred*)

	1993-1995 Births		1990-1992 Births	
	Survivors	Closed	Survivors	Closed
Adj R sqd	.655	.608	.629	.559
Human Capital				
College degree % of adults '90	**0.14**	**0.04***	**0.17**	**0.19**
	2.50	0.69	3.17	3.24
High-school dropout % of non-college adults '90	**0.18**	**0.23**	**0.09**	**0.19**
	4.23	5.02	2.16	4.03
Intensity of service estab/population	**0.54**	**0.65**	**0.42**	**0.50**
	5.01	5.68	3.84	4.20
Regional Characteristics				
Population growth	**0.41**	**0.51**	**0.38**	**0.42**
	12.57	14.92	10.63	10.95
Per capita income growth	**0.19**	**0.17**	**0.14**	**0.12**
	5.69	4.84	3.90	3.11
Population (logarithm)	**0.13**	**0.19**	**0.16**	**0.19**
	2.67	3.56	3.20	3.61
Unemployment rate	**-0.04***	**-0.16**	**0.19**	**0.15**
	-0.99	-3.67	4.40	3.16
Avg. size of all establ (employment)	**-0.30**	**-0.35**	**-0.29**	**-0.35**
	-.7.39	-8.01	-6.57	-7.23
Intensity of all estab/population	**-0.05***	**-0.21**	**0.07***	**-0.16***
	-0.52	-2.13	0.76	-1.55
n	394	394	394	394

* Birth rates are 3-year average births per 1000 labor force in prior year
Undated exogenous variables represent prior year,or prior 2 year averages

APPENDIX

Service Industry Subsectors, with Standard Industrial Classification Codes, 1995 Establishments and Employment, Changes to 1998, and 1996-98 Firm Formations per 100 Establishments in 4-digit Industry

Subsectors	Industry SIC	Establishments 1995	Establishments 95-8 Chng	Employment 1995	Employment 95-8 Chng	Firm Birth Rate
Local Business Market, High-school Education						
Linen Supply	7213	1,194	-4.7%	46,950	3.0%	4.33
Industrial Launderers	7218	1,297	4.2%	62,821	10.6%	2.78
Photocopying and duplicating services	7334	5,163	8.0%	72,374	17.9%	7.72
Secretarial and Court Reporting	7338	6,548	7.5%	36,260	25.6%	15.50
Disinfecting and Pest Control Services	7342	10,165	2.7%	78,782	9.8%	7.85
Building Cleaning and Maintenance Servic	7349	45,098	6.3%	794,517	10.3%	16.41
Equipment rental and leasing, nec.	7359	17,891	1.4%	167,861	10.5%	5.90
Detective & armored car services	7381	11,090	6.1%	514,011	13.5%	11.69
Security Systems Services	7382	2,980	30.8%	57,924	35.6%	14.22
Business services, nec.	7389	60,765	15.6%	747,252	28.6%	16.22
Truck rental and leasing, no drivers	7513	4,140	12.5%	36,950	34.1%	3.40
Refrigeration and Air-Conditioning Servi	7623	3,557	1.2%	26,978	9.7%	7.77
Electrical and Electronic Repair Shops,	7629	9,412	-4.0%	64,051	3.9%	7.50
Welding Repair	7692	5,857	0.4%	35,066	12.6%	8.56
Armature Rewinding Shops	7694	2,335	-6.5%	24,459	-3.4%	2.56
Local Consumer Market, High-school Education						
Rooming and Boarding Houses	7021	1,523	2.0%	10,915	0.0%	10.11
Organization Hotels and Lodging Houses,	7041	2,090	-8.1%	14,048	2.9%	2.87
Power Laundries, Family and Commercial	7211	1,680	3.5%	24,998	-4.7%	9.62
Garment Pressing, and Agents for Laundri	7212	3,061	-0.5%	14,198	6.9%	8.34
Coin-operated laundries and cleaning	7215	12,473	-0.6%	53,307	5.0%	9.92
Drycleaning Plants, Except Rug Cleaning	7216	20,734	-3.6%	165,597	-1.8%	6.44
Carpet and Upholstery Cleaning	7217	7,499	6.0%	41,019	10.3%	15.16
Laundry and Garment Services, n.e.c	7219	3,069	-3.7%	19,159	-5.0%	10.01
Photographic Studios, Portrait	7221	11,628	8.1%	71,151	-7.3%	7.33
Beauty Shops	7231	73,386	-1.3%	390,050	4.0%	9.21
Barber Shops	7241	4,444	-6.6%	15,744	-2.9%	6.71
Shoe Repair Shops and Shoeshine Parlors	7251	2,194	-16.6%	6,654	-13.4%	7.06
Miscellaneous personal services, nec.	7299	16,214	9.9%	110,545	11.2%	16.83
Medical Equipment Rental and Leasing	7352	2,570	6.4%	28,256	2.2%	7.43
Photofinishing laboratories	7384	6,675	-13.4%	71,974	-0.7%	4.77
Utility Trailer and Recreational Vehicle	7519	661	-2.4%	4,087	5.1%	7.06
Automobile parking	7521	8,370	6.2%	56,590	13.4%	2.22
Top & body repair & paint shops	7532	32,403	1.4%	186,647	10.7%	7.98
Auto Exhaust System Repair Shops	7533	5,203	0.2%	26,152	-1.6%	4.95
Tire Retreading and Repair Shops	7534	2,071	0.5%	17,633	-5.4%	8.59
Automotive Glass Replacement Shops	7536	4,092	20.7%	22,346	28.8%	8.17
Automotive Transmission Repair Shops	7537	5,912	2.0%	27,227	9.0%	8.56
General automotive repair shops	7538	67,205	5.0%	288,119	8.9%	10.22
Automotive repair shops, nec.	7539	9,615	-4.4%	45,270	4.0%	5.49
Carwashes	7542	11,290	5.5%	113,585	6.8%	14.45
Automotive services, nec.	7549	10,818	20.0%	83,063	22.9%	13.54
Radio and Television Repair Shops	7622	5,446	-5.5%	31,319	4.9%	7.63
Watch, Clock, and Jewelry Repair	7631	1,706	1.3%	6,555	4.1%	9.30
Reupholstery and Furniture Repair	7641	6,282	-4.6%	24,452	4.1%	9.65
Repair services, nec.	7699	34,028	0.6%	233,730	6.4%	8.70
Motion Picture Theaters, Except Drive-In	7832	5,610	-4.2%	107,422	17.7%	2.83
Drive-In Motion Picture Theaters	7833	361	-24.7%	3,263	-2.1%	3.05
Video Tape Rental	7841	18,707	3.0%	154,980	-1.0%	6.65

Bowling Centers	7933	5,608	-7.6%	93,357	-7.2%	4.10
Sports clubs, managers & promoters	7941	1,279	17.6%	38,423	19.9%	18.11
Racing, including track operators	7948	2,437	-1.1%	53,692	2.3%	12.67
Coin-Operated Amusement Devices	7993	4,324	0.3%	41,271	29.2%	8.33
Amusement Parks	7996	771	1.9%	72,033	26.1%	8.95
Membership Sports and Recreation Clubs	7997	11,751	1.9%	261,628	4.5%	4.50
Amusement and recreation, nec.	7999	20,840	5.2%	357,092	18.3%	11.97
Child Day Care Services	8351	49,193	9.2%	519,021	13.3%	9.66
Residential Care	8361	27,495	11.8%	537,332	14.3%	6.94
Civic, Social, and Fraternal Association	8641	42,371	-4.1%	393,030	2.1%	3.00
National Market, High-school Education						
Hotels and motels	7011	40,179	7.2%	1,450,076	4.8%	8.22
Sporting and Recreational Camps	7032	2,277	1.7%	16,068	12.0%	4.98
Recreational Vehicle Parks and Campsites	7033	2,778	3.2%	16,753	1.0%	8.70
Heavy construction equipment rental	7353	3,743	17.3%	44,202	27.4%	7.51
Passenger Car Rental	7514	3,950	-3.9%	84,792	21.5%	5.64
Local Business Market, Advanced Education						
Computer Related Services, n.e.c.	7379	14,951	76.2%	113,906	94.1%	39.08
Legal services	8111	151,358	1.9%	949,165	3.5%	7.68
Accounting, Auditing, and Bookkeeping Se	8721	76,299	0.7%	553,725	19.2%	7.86
Management Services	8741	23,077	24.5%	429,774	23.8%	17.01
Local Consumer Market, Advanced Education						
Offices & clinics of medical doctors	8011	183,532	-2.6%	1,559,081	9.3%	5.10
Offices and clinics of dentists	8021	106,936	2.0%	613,709	8.2%	4.16
Offices and Clinics of Doctors of Osteop	8031	7,038	-3.7%	44,361	2.2%	7.88
Offices and Clinics of Chiropractors	8041	27,009	1.3%	88,417	3.6%	8.27
Offices and Clinics of Optometrists	8042	16,151	1.6%	74,213	10.1%	5.77
Offices and Clinics of Podiatrists	8043	7,574	-1.9%	30,081	1.4%	5.20
Offices and Clinics of Health Practition	8049	22,644	12.7%	146,088	28.2%	13.54
General Medical and Surgical Hospitals	8062	4,382	-0.5%	2,919,713	1.9%	1.16
Psychiatric Hospitals	8063	603	-6.1%	90,289	-14.0%	2.71
Medical Laboratories	8071	7,501	8.0%	137,977	-1.7%	7.43
Specialty Outpatient Facilities, n.e.c	8093	10,171	32.6%	224,583	18.5%	8.28
Elementary and Secondary Schools	8211	15,158	6.0%	550,225	10.6%	4.09
Junior Colleges and Technical Institutes	8222	555	-3.8%	56,071	0.4%	2.88
Religious Organizations	8661	148,451	4.3%	1,308,329	10.6%	4.48
National Market, Advanced Education						
Advertising Agencies	7311	13,170	3.1%	144,935	15.4%	10.93
Computer Programming Services	7371	20,190	47.3%	301,811	49.4%	25.60
Prepackaged Software	7372	5,298	41.6%	121,341	43.7%	19.53
Computer Integrated Systems Design	7373	5,310	29.9%	101,882	45.5%	17.06
News Syndicates	7383	485	2.1%	8,738	15.3%	5.02
Botanical and zoological gardens	8031	416	10.6%	13,885	19.0%	8.65
Specialty Hospitals, Except Psychiatric	8069	621	12.4%	203,385	2.6%	3.81
Colleges, Universities, and Professional	8221	2,312	7.4%	909,798	7.6%	3.55
Museums and art galleries	8412	3,450	9.6%	60,720	11.6%	6.44
Professional Membership Organizations	8621	5,778	7.3%	58,331	9.7%	5.98
Engineering Services	8711	38,924	12.8%	651,725	17.9%	10.60
Architectural Services	8712	17,304	7.6%	139,428	20.6%	9.67
Commercial physical research	8731	5,152	17.0%	159,564	11.9%	14.03
Commercial Economic, Sociological, and E	8732	5,114	3.3%	117,740	18.5%	7.80
Noncommercial Research Organizations	8733	3,216	5.0%	82,687	11.4%	7.51
Management Consulting Services	8742	36,378	24.8%	356,324	41.4%	20.01
Business Consulting, n.e.c.	8748	15,458	20.1%	123,091	15.4%	19.11
Local Business Market, University Education						
Advertising, n.e.c.	7319	2,083	17.3%	39,270	25.8%	16.07

Commercial Photography	7335	3,615	-1.5%	21,028	-11.6%		8.47
Commercial art and graphic design	7336	11,689	11.0%	65,727	26.4%		14.90
Employment Agencies	7361	12,314	16.2%	382,453	36.0%		14.32
Help supply services	7363	17,842	33.9%	1,974,710	41.3%		10.38
Computer Processing and Data Preparation	7374	7,364	14.4%	228,356	18.2%		6.81
Computer Facilities Management	7376	646	31.4%	25,674	15.0%		12.02
Computer Rental and Leasing	7377	843	3.4%	12,005	16.3%		7.55
Computer Maintenance and Repair	7378	4,440	1.1%	50,987	14.3%		12.45
Passenger Car Leasing	7515	999	-11.6%	11,145	3.5%		6.37
Business Associations	8611	13,922	0.3%	103,424	-3.2%		3.75
Labor Unions and Similar Labor Organizat	8631	18,159	-6.3%	159,167	-1.0%		2.08
Surveying Services	8713	8,503	3.4%	53,121	17.0%		7.69
Facilities Support Management Services	8744	881	77.2%	58,032	10.9%		10.18
Local Consumer Market, University Education							
Funeral Service and Crematories	7261	15,291	1.8%	98,423	6.9%		2.74
Tax Return Preparation Services	7291	7,990	16.8%	144,908	-0.6%		13.71
Dance studios, schools, and halls	7911	4,998	2.9%	26,792	11.6%		10.21
Theatrical producers and services	7922	5,769	10.8%	82,003	17.0%		13.30
Entertainers &entertainment groups	7929	6,143	10.4%	69,524	6.6%		14.52
Physical fitness facilities	7991	8,644	11.2%	152,430	19.7%		15.93
Public Golf Courses	7992	3,544	16.3%	55,261	18.6%		8.97
Skilled Nursing Care Facilities	8051	10,546	-12.5%	1,115,205	-7.2%		0.37
Intermediate care facilities	8052	4,452	-12.8%	229,765	-9.1%		0.26
Nursing and Personal Care Facilities, n.	8059	2,507	-18.9%	124,619	-13.6%		0.93
Home Health Care Services	8082	11,615	33.3%	607,283	16.3%		14.74
Kidney Dialysis Centers	8092	1,450	46.0%	34,021	25.8%		3.66
Health and Allied Services, n.e.c.	8099	4,977	-8.3%	99,201	5.5%		5.11
Libraries	8231	2,078	5.6%	20,294	16.2%		4.51
Data Processing Schools	8243	1,423	46.2%	15,959	58.0%		26.68
Business and Secretarial Schools	8244	651	-12.7%	16,251	-8.5%		6.45
Vocational Schools, n.e.c.	8249	3,156	16.5%	48,200	20.0%		12.53
Schools and Educational Services, n.e.c.	8299	13,982	15.7%	136,885	20.6%		14.21
Individual and Family Services	8322	35,606	19.3%	516,329	19.3%		8.89
Job Training and Vocational Rehabilitati	8331	7,570	3.1%	292,757	3.9%		3.85
Social Services, n.e.c.	8399	16,283	6.9%	231,952	1.6%		6.16
Political Organizations	8651	1,539	16.8%	7,638	24.6%		23.93
Membership Organizations, n.e.c.	8699	9,338	-0.4%	77,261	12.5%		3.32
National Market, University Education							
Outdoor Advertising Services	7312	1,172	10.3%	12,023	7.5%		11.77
Radio, TV, publisher representatives	7313	1,874	21.0%	20,938	40.9%		13.73
Adjustment and Collection Services	7322	5,037	-5.5%	75,075	14.7%		7.41
Credit reporting services	7323	1,718	-10.5%	29,132	28.8%		5.67
Direct Mail Advertising Services	7331	4,024	-4.3%	83,890	8.0%		8.37
Information Retrieval Services	7375	1,082	257.7%	25,183	188.9%		101.97
Motion picture & video production	7812	7,622	7.8%	70,992	9.6%		14.82
Services Allied to Motion Pictures	7819	2,807	25.0%	37,321	53.3%		15.88
Motion picture & tape distribution	7822	1,041	-4.6%	18,480	81.4%		8.07
Motion Picture Distribution Services	7829	159	-8.8%	1,095	4.7%		6.08
Dental Laboratories	8072	7,080	-1.7%	41,473	2.1%		6.13
Testing Laboratories	8734	4,603	5.0%	71,049	11.5%		6.75
Public Relations Services	8743	5,037	10.2%	38,148	25.6%		12.92
Services, nec.	8999	22,167	-2.5%	168,746	3.7%		7.95
Note: All changes are calculated as the 3-year difference (or the sum of 3 years of firm births),							
divided by the appropriate 1995 base.							

Endnotes

[1] The SUSB data and their Longitudinal Pointer File were constructed by the Bureau of the Census under contract to the Office of Advocacy of the U.S. Small Business Administration. For documentation of the SUSB files, see U. S. Small Business Administration (1999).

[2] The LEEM data cover all private sector businesses with employees, with the exception of those in agricultural production, railroads, and private households. This is the same universe that is covered in Census' annual County Business Patterns publications, but establishments with positive payroll during a year and no employment in March of that year are not counted for that year for this project.

[3] Annually, there were less than 150 such large apparent births of single-unit firms, with an average of about 1500 employees each. About a third of these larger single unit firms were employee-leasing firms or employment agencies, while the remainder were widely distributed across industries. However, examination of the new firms with 100-499 employees in their first year showed that most seemed to be credible startups, frequently in industries that are associated with large business units, such as hotels and hospitals. Since this study is not concerned with the employment impact of startups, there is no danger of the bulk of the data on smaller startups being swamped by that of a few larger startups that might actually be offshoots of existing businesses. Therefore, the startups with 100 to 499 employees were included, if they qualified otherwise.

[4] About 400,000 new firms generally appear in the business register (with some positive annual payroll) the year before they have any March employment, and we postpone their 'birth' until their first year of reported employment. An average of 90,000 older firms each year have no employees in March, but recover some employees the following year.

[5] We tested a similar rule using one-half, and found that the primary difference was in quite small multi-unit firms, where the smaller share was more credible for the first year.

[6] For example the city of Baltimore is smaller than the County of Baltimore, and many of the people that work in Baltimore city live outside the city limits. In addition, a large proportion of the people in adjacent counties work and shop in other parts of the urban agglomeration of which Baltimore is the center.

[7] These LMA's are defined according to the specification of Tolbert and Sizer (1996) for the Department of Agriculture, using the Journey-to-Work data from the 1990 U.S. Census of Population. They are named according to the largest place within them in 1990. Some LMA's incorporate more than one MSA, while others separate some of the larger MSA's into more than one LMA, depending on the commuter patterns. A few smaller independent (usually rural) Commuting Zones have been appended to adjacent LMA's so that each LMA had a minimum of 100,000 population in 1990. Alaska and Hawaii each are treated as a single integrated LMA. See Reynolds 1994 for further discussion of LMAs.

[8] We code the location of each establishment according to its initially specified state and county in the LEEM. The few businesses that report operating statewide (county = 999), or are missing their county code, have been placed into the largest LMA in each state.

[9] In fact, birth rates were calculated for each annual period from 1990 through 1998, but these were found to be quite consistent in their rank ordering across LMA's, so the average of the three most recent years was used for most of this analysis. Using period averages serves both to smooth out irregularities and to minimize the possibility of disclosure problems with very small numbers of annual births for the smaller LMAs and subsectors.

[10] Although we have annual firm formation data for 1990 through 1999, we have chosen not to use pooled cross-section time series regressions, because most of the independent variables describing the characteristics of the LMAs change very little over time, and the errors from omitted variables will be nearly identical for each LMA from year to year, so the diagnostic statistics from such an analysis would be very misleading.

[11] This number has increased considerably since then, but more recent data on educational attainment from the 2000 Census of Population have not yet been released at the county level, which is needed to construct the LMA level data.

[12] We have also abstained from considering financial variables and regional knowledge factors such as research and development expenditures. The availability of adequate financial resources to fund new firms is an important determinant of new firm formation, which we hope to take into account in subsequent research. Both university-based and industrial research and development activity may be probably important stimulants to regional new firm formation rates, including those in services.

[13] These can be calculated from the ordinary coefficients, but it is more illuminating to view them as being estimated from standardized variables. In this case, rather than using the levels, ratios and percents whose means and deviations are shown in Table 3, we transform each variable by subtracting its mean value (calculated from all 394 LMA values) and then divide this adjusted value by the standard deviation of all 394 values. Each of these transformed variables has a mean of zero and a standard deviation of one, and each value represents the deviation of that particular LMA from the mean of that variable. Since the 394 LMAs constitute the universe at a point in time (rather than a sample of areas), it is apparent that the resulting standardized beta coefficients can be interpreted quite simply as measures of the impact of one standard deviation of the independent variable on the standardized dependent variable. For example, using standardized variables, if we estimate that $x = .1y + .5z$, then we can say that each standard deviation in the value of y is associated with 0.1 of a standard deviation of x, and each standard deviation of z is associated with half of a standard deviation of x. Obviously, it follows that x is five times more sensitive to z than to y.

[14] Note that when estimated in separate equations for 1996-98 the coefficient for College degree falls to .10 and that for high school dropout falls to .12, while other coefficients remain substantially the same.

[15] We originally hoped to base this classification on the BLS occupational distribution data for each (three-digit) industry, but we found that many activities requiring academic skills or advanced training for leadership positions, in fact had occupational distributions very heavily weighted toward semi-skilled and unskilled workers. Hospitals and hotels were extreme examples of this contrast between educational requirements for workers and those for the individual responsible for starting the business.

[16] The Appendix entries do not sum to the national totals for each subsector because of the infrequent occurrence of establishments that were never classified to the 4-digit level. These were generally assigned to the four digit code that had the most establishments reported within the SIC classification provided, but they are not included in the aggregate data in the Appendix.